

Chapter 14

The Ultimate Shelter Test

“Three minutes until zero time,” said the voice. “Three minutes. All personnel should be at their assigned locations.” I looked around the shelter containing the 16 of us. Carl Miller was creeping out of the tunnel that led to the fallout collection station. I raised my eyebrows and he said, “Ready to go.” Dick Laurino followed Carl out of the tunnel and they both sat down on the floor. Down at the other end of the shelter, Bill Trolenberg, one of ten AEC people assigned to the project, was at the dosimeter tube. “Is it capped?” I called. “Yes, it’s capped,” he answered. I continued to go down the final check list.

“Two minutes until zero time,” said the voice on the annunciator. “Two minutes. All observers will turn their backs to ground zero. Do not attempt to watch the detonation until after the flash is over.” We did not have to worry about the flash. We were in a buried shelter and buttoned up. And a good thing, too, because we were located less than a mile from ground zero as the countdown to Shot Diablo proceeded. The field phone rang. I picked up and said, “PLUMBBOB Project 32.3 ready.”

I positioned the team for the shot. We had practiced the position during the rehearsal. We sat on the concrete floor in two rows back to back and far enough from the wall that those on that side did not touch it. The shelter was a Navy ammunition storage magazine constructed of heavy corrugated steel. It was an arch 24 feet wide and 50 feet long with steel end walls braced at the midpoint. There was three feet of earth overhead and the theory was that the arch would flex under the blast to the extent that the earth itself would support most of the load.

“One minute to zero time,” said the voice. I looked around the shelter and up at the industrial-type lights. “I suggest everyone look down at the floor at shot time,” I called. “If the shock should break a light bulb, let’s not get it in the eyes.” “Thirty seconds,” said the voice. There was an anticipatory rustle among the group. “Twenty seconds. Ten, nine, eight, seven, six, five, four, three, two, one, zero,” said the voice. I started to count, “One, two, three, four, five, six. . .” I knew something was wrong. The blast wave should have arrived within five seconds. “Attention, all personnel,” said the voice. “Remain facing away from shot point. There has been a misfire.” “Oh, shoot,” I said or something like that.

“Okay, fellas,” I continued, “Relax but stay away from the walls. That damned thing might go off unexpectedly.” Shortly, the phone rang. I picked up and got a message from the control point. “We are going to be stuck here for a few hours,” I told the team. “They are checking out all the wiring and some hero has got to go up that tower and disarm the weapon. We can’t leave until that is done. So, have some breakfast and grab some sleep.” It was dawn outside. We had come into the shelter the evening before and had spent an uncomfortable night in sleeping bags or doing last-minute checks of our equipment. Breakfast was cold C-rations. As I unrolled my sleeping bag, I realized that I

had a few hours to think about how we got into this situation—just one more complication in the craziest project I had ever encountered.

The Holifield Connection

It all started when Chet Holifield got hooked on civil defense. Holifield was a Democratic congressman from Los Angeles. After the war, through seniority and some deft politicking, he was able to position himself to dominate the emerging field of atomic energy. By foregoing the chairmanship of the House Government Operations Committee, a choice assignment, Holifield got himself named as the ranking representative on the new Joint Committee on Atomic Energy. In the House, he took the Military Operations Subcommittee within the Government Operations Committee. Thus, he had a strong influence on legislation affecting both the Defense Department and the Atomic Energy Commission. Needless to say, Chet Holifield had a lot of clout in both agencies.

In 1955, Holifield discovered civil defense. In 1956, his Military Operations Subcommittee held a series of hearings on the status of civil defense. One hearing was held in Los Angeles, where I was called to testify. I describe all that in another chapter. Suffice it to say here that Holifield and his staff were impressed by what they heard. Not too long thereafter, I got a telephone call from Robert Corsbie of the Atomic Energy Commission (AEC) headquarters. I had heard of Corsbie although I had never met him. He was head of the Civil Effects Test Group, which ran projects at the Nevada Test Site of interest to civil defense.

Corsbie said that he was preparing the civil effects test schedule for the PLUMBBOB test series set for the summer of 1957 and he would be happy to entertain a project proposal. I had attended an NRDL planning meeting on PLUMBBOB earlier at which it had been decided that we would not participate because the roughly two dozen shots planned were all balloon or tower shots with not much fallout expected. So I told Mr. Corsbie that we were not interested. He sounded disappointed but left it at that.

Later that day, I mentioned the call to Paul Tompkins. “I trust that is the last we hear of that,” said the Scientific Director.

About a week later, Mr. Corsbie called again. One of the tower shots, Shot Diablo, was expected to go at least 20 kilotons. That should produce plenty of fallout. So, wouldn’t I be interested in proposing a test project? When I had talked over his previous call with Paul Tompkins, we had concluded that in light of my other commitments and the restrictions of our budget we ought not to plan to participate in Operation PLUMBBOB. I explained the situation to Mr. Corsbie. I had just returned from a stint at Eniwetok in Operation REDWING. Part of my old Engineering Applications Branch at the Laboratory had been spun off into a new Military Evaluations Group to which I was heavily committed, and furthermore, our budget would not support the kind of field operation that would make participation worthwhile. Corsbie said that he understood my reluctance but he hoped that I would reconsider.

Soon after that conversation, I was notified that Robert L. Corsbie had forwarded his clearances and would visit NRDL shortly. Paul Tompkins called to propose a council of war with the NRDL CO, Bob Hinnners. "Mr. Corsbie seems very insistent," opined Captain Hinnners. "I think we should all be reading from the same page." "Right," said Paul, "Let's review the situation." They both looked at me.

"Our applicable weapons test work was done at Operation JANGLE in 1951," I began. "It was very successful despite a lot of organizational problems." I reminded them of the fact that weapon tests were planned and carried out to satisfy the needs of the weapon designers at Los Alamos and Livermore and not for us in the defense business. Indeed, Operation JANGLE was the first chance we had had since Operation CROSSROADS to study fallout. The attraction was a planned underground shot in which the weaponeers were to test some of the diagnostic techniques they might use if atmospheric testing were ever banned. Not only was NRDL interested in exploring the fallout from the underground shot but so was our competitor laboratory that had just been set up by the Army Chemical Corps. Additionally, the Army Quartermaster Corps independently wanted to expose equipment to the fallout and decontaminate it. The AEC test organization insisted that we consolidate all this into a single project. Thus was born Project 6.2, with me the project leader. I organized the effort into seven subprojects that would operate more or less independently once I had coordinated their plans so that they did not run into each other.

"Joe Maloney ran the ChemCorps effort," I continued. "They were mainly testing their chemical warfare filters to see if they would keep fallout out of shelters. Of course, they did. Ernie Dhein did the Quartermaster project almost single-handed. He laid out all sorts of Army gear along a corridor in the direction that the test site weather people had told him the fallout would go. Of course, it went more northerly and almost all of his gear was missed. He spent two weeks after the shot hauling contaminated desert sand to sprinkle on his stuff so he could decontaminate it."

The NRDL research was more fundamental and also more generally useful. The fact that the fallout had gone more to the north than had been anticipated was a good break for us. Based on the radsafe survey after the shot, we chose an area of several acres that was more or less evenly contaminated. The day after the shot we dressed out and, accompanied by a radsafe monitor, we laid out stakes in the area and made detailed measurements at ten-yard intervals. In the afternoon, we brought a large crane into the center of the area. I claimed the honor of first aloft. Sitting in a sling with two T-1B instruments in my lap, I called out the readings at five-foot intervals as I was hoisted as high as the crane boom would take me. Then, I repeated the readings on the way down.

These measurements were important because our theoretical guys could calculate the attenuation of the radiation intensity with height only for an idealized smooth infinite plane. But real situations included ground roughness, and limited fields of fallout. Our measurements were later used to conclude that good fallout shelter existed in high-rise buildings above the third floor.

Later, we used motorized scrapers and graders to scrape an inch or two off the contaminated ground, starting small and then progressively enlarging a cleared square, making measurements both at ground level and at altitude with the crane at each stage. Also, Lou Werner had taken samples at each stage for analysis back at the Lab. The critical review of all results had satisfied us of the value and reliability of the work.

“We could, of course, repeat the earlier work,” I said. “It is always useful to be able to repeat an experiment. But I don’t think it would be worth the effort. Besides, I am now in charge of Military Evaluations, not Engineering Applications, and I should not be involved in field work.”

“This guy Corsbie wants you,” said Paul. “Holifield’s chief of staff, Herbert Roback, probably told someone high up in the AEC to get you involved and Corsbie has his instructions. You probably shouldn’t have shown Roback those shelter plans.”

I had forgotten all about that. I had been intrigued at Operation JANGLE with a project of the Navy civil engineers in which they had buried a standard Navy ammunition storage magazine, a flexible-arch structure, at a point that would experience about 50 psi aboveground. It had performed very well and some of my staff and I had fooled around with adapting the structure to be a public blast shelter for as many as 100 people.

“What a great idea!” I said. “If he pushes us to the wall, so to speak, why don’t I propose a project where we build a shelter close to ground zero, occupy it during the shot, come out afterwards and decontaminate the area around the shelter to prove out the countermeasures system. The test people probably would never approve such a radical proposal and we would be out of it!”

“Sounds good,” agreed Paul. “Even if they approve it, it would be a worthwhile project. And just in case it does get approved, make sure the AEC pays for it.”

The Corsbie Complications

In due course Robert Corsbie arrived at the Laboratory. Captain Hinners greeted him officially, described our new windowless NRDL building and passed him off to Paul Tompkins. The Scientific Director gave him a quick tour of the technical areas and delivered him to my office. Turning to the issue at hand after the usual courtesies, it was soon apparent that Mr. Corsbie was under instructions to strike a deal. Despite all the negative reasons I had assembled, he was not taking “no” for an answer. So, finally, I reached for a folder on my desk and trotted out the project that Hinners, Tompkins, and I had discussed earlier. I even had a title for it: Evaluation of Countermeasure System Components and Operational Procedures. Corsbie took it eagerly. When he comprehended what we had in mind, I swear he blanched but he gamely shook that off and vowed to take the proposal back to Washington and fight for it. I pointed out the provisional cost estimate to him and made him understand that the AEC would need to underwrite the project.

Several weeks later, a Corsbie letter arrived stating that the project had been approved as part of the Civil Effects Test Group program and requesting shelter construction plans and much other information. That began a flurry of activity even though the date of Shot Diablo was still many months away. I was experienced by this time with the management of weapon test projects and set up a little project organization within which I delegated most of the responsibility.

Shortly, a Corsbie letter arrived announcing that (a) ChemCorps would provide a collective protector (a big ventilation unit with the filter tested in Operation JANGLE) for installation in the entrance tunnel to the shelter, and (b) the verdict of an advisory committee of scientists that we must use the ChemCorps unit to avoid the potential hazard of fallout being drawn into the shelter. I grumbled that any fallout heavy enough to drop within a mile of the shot was too heavy to be drawn down the entrance to the shelter but we duly revised the plan of the entranceway, which was made of plywood covered with sandbags and which terminated at a standard Navy watertight door at the shelter.

Months later, another Corsbie letter arrived telling me that the AEC had decided that Project 32.3, as it was officially designated, would be an ideal opportunity for the senior health and safety personnel at the various AEC facilities to gain experience in a real fallout situation. They proposed to add a dozen or more people to my project and when should they report to the test site? Well, after all, they were paying for the whole thing, so why not? I negotiated the additions to a total of ten and specified that they show up at the Nevada Test Site two weeks before shot time so that we could have plenty of time for rehearsals. I also scheduled my own team to arrive then.

Shot Diablo was scheduled for dawn of June 11, 1957. This, of course, was the earliest shot time. If the winds aloft were aimed at St. George, Utah, there would be a delay for a day or two. At Nevada Test Site, flexible time was spoken and, as I lay there in my mummy bag on the shelter floor, I realized that we were about to set a new record for flexibility. There had never been a misfire before and, as I reviewed the shot schedule in my mind's eye, it might be months before Shot Diablo could be rescheduled.

In late May, two weeks before the scheduled shot time, we arrived at Mercury, as the base at the Nevada Test Site was now called. The personnel office had our passes and we had billets assigned together in one of the barracks. Naturally then, I was shocked to discover that our shelter had not been built! The construction company under contract at the site, Holmes and Narver, had the plans and all the material was in one of their warehouses but they advised that the project was not on the approved list. I checked with the test director's office and they confirmed, to my dismay, that Mr. Corsbie had not submitted the project for approval as was required. Mr. Corsbie was back in Washington and a good thing because if he had been on site I would have wrung his neck. Further inquiry established that the test director, Dr. Gerald Johnson, of the Lawrence Livermore Laboratories was holding a meeting of his steering committee that very evening—and after much begging I got my project on the agenda.

I hurried back to the barracks and threw together a briefing with some “sincere” (meaning hand-drawn) briefing aids. I must have made a good presentation because after some questions about safety (this would be the closest manned station to any shot in Nevada), Johnson asked the Holmes and Narver representative if he could get the shelter installed in time for the rehearsal two days before shot time. I held my breath. Holmes and Narver said that he could if overtime was authorized. Since it was an AEC project, overtime was authorized and we had an approved project. On succeeding nights, the far desert glowed as the construction crews worked around the clock to get our shelter in the ground.

A formal rehearsal was always conducted 48 hours before every shot at the Nevada Test Site. That meant that we would go into the shelter the night before the rehearsal and be ready for the rehearsal of the shot the next morning. Holmes and Narver certified the shelter as complete about ten in the morning so we decided to go out early to make sure it was operational and to get our sampling trays ready. The situation when we reached the shelter location on the north side of the shot tower was depressing. The dirt excavation leading down into the entranceway was encumbered with extra sand bags and the interior of the shelter was dirty and strewn with construction scraps. But worst of all, the earth berm over the shelter was not level and was not carried out beyond the shelter as called for in the plan. The dirt had just been heaped haphazardly over the shelter.

Despite all this, the team went to work with a will and by mid-afternoon we had a clean shelter with all the equipment checked out. We rehearsed the interior operations plan several times and the next morning carried out the dummy run without a hitch. I was particularly pleased that our telephonic and backup radio requests for the earthmoving equipment that was to decontaminate the area around the shelter were promptly met.

That evening, the test director held his review of the rehearsal. When it came my turn, I stated that the rehearsal was a success except for the fact that the earth cover over the shelter was not in place according to the construction plan. I explained to Dr. Johnson that the earth cover was designed to direct the blast load to the shelter footings rather than the shelter itself and that I would not take 16 people into the shelter for the shot with the berm in that condition. Well! In the subsequent discussion, I was supported by Luke Vortman and Mel Merritt, two blast experts from Sandia Corporation, and ultimately Holmes and Narver was instructed to fix the earth cover pronto. The lights burned in the desert again that night.

The Real Thing

We remained in the shelter after the misfire for six hours before we were allowed to get in our jeeps and return to base. We had some hopes that the weapons people would find a short in the firing cable and reschedule in a day or two but that was not to be. After several days of rumors, Shot Diablo was scheduled for July 15. We secured the shelter and I sent everyone home until four days before the new shot time.

“Three minutes until zero time,” said the voice. “Three minutes. All personnel should be at their assigned locations.” I looked around the shelter containing the 17 of us.

Seventeen? Yes, we had been honored by the man himself, Robert L. Corsbie, who had swept into Mercury two days before and had announced to Gerald Johnson that he was joining my team for the shot. I found out when his satrap, one Joe Deal, stopped by the barracks. Whereas Corsbie was slim and somewhat dandyish with his pencil-thin mustache, Joe Deal was chunky like a bulldog and obviously Corsbie's hatchet man.

Corsbie did not attend rehearsal, preferring to hang out with the test director. Joe Deal was not to be in the shot team and did not stand in for his boss. As I recall, Corsbie did arrive at the shelter late in the evening before the shot and tended to hog the telephone like the executive he had cast himself to be. An hour before shot time, however, I told him the phone was off limits to anyone but me. I was cold and precise but I suspect he knew I was pissed off at him for screwing up the approval of my project. I also suspect he was tempted to spit in my eye but he probably thought about Representative Chet Holifield and Herb Roback and swallowed his spit. I told him to stick with me while I went down the preshot check list. He did.

We had added two items since the misfire. Near the end wall was a movie camera on a tripod aimed to cover the whole shelter area. Next to it was a reel-to-reel tape recorder to capture the sounds. This was, of course, the best we could come up with until the camcorder could be invented. "Two minutes until zero time," said the voice on the annunciator. The field phone rang. I picked up and said, "PLUMBBOB Project 32.3 ready."

We got into position for the shot. I put Corsbie on the far end of the line. Several team members had survey instruments in their laps. They were intent on seeing if the initial radiation from the detonation would penetrate the shelter and cause the needle to jump on their instrument. "One minute to zero time," said the voice. I got up, turned on the camera and the recorder and sat back down.

"Thirty seconds," said the voice. There was a rustle among the group. "Twenty seconds. Ten, nine, eight, seven, six, five, four, three, two, one, zero." I started to count, "One, two"—the concrete floor bumped and shook under me—"Three, four"—the blast wave tore overhead with a crash that we all agreed later sounded like someone slamming the cover on a garbage can—with you inside. I glanced up at the lights. They were all OK but the air seemed cloudy. What later was confirmed by the movie footage was that every bit of dust in the supposedly clean shelter had been bounced into the air by the flexing of the shell of the shelter.

I continued to count up as I glanced down the row at my team members. Dick Laurino was madly twisting the scale adjustment on his survey meter. Dick told me later that at zero time his needle went off-scale and stayed that way no matter what scale he changed to. Next to him, Carl Miller was calmly writing down his observations in his field notebook. When my count got to twenty, the team rose from the shot position and each went about his assigned task. Trolenberg sprinted down to the dosimeter tube and ran the rod up it to knock off the cap at the top, some three feet above the earth cover. Someone else set up a stepladder mid-shelter and put a wrench to the nuts securing a plate to the bottom of the ventilation exhaust in the overhead. At the same time, another team member was

taking the blast plate off the ventilation intake near the shelter door. Soon, the punch of a button caused the ChemCorps collective protector to hum into action. I let out a cheer, which was echoed elsewhere. The ventilation unit had survived the blast wave.

I organized the shelter survey party. First, Trolenberg put a pencil-sized dosimeter on the end of the rod and ran it up the tube where it was exposed. A team member recorded the time. Three minutes later, Bill brought the dosimeter back down and read the increase in dose. Since that dose was received in three minutes, multiplying it by 20 gave the dose rate in roentgens per hour. Meanwhile, other team members were reading the survey meters, which were calibrated in roentgens per hour as well. In this fashion, we established that the radiation level in the shelter was only about one-ten thousandth of the level outside. Fortunately, we had located the shelter correctly and got the full brunt of the fallout from Shot Diablo.

Carl Miller had disappeared into the tunnel leading to the sampling room. Here he was capturing consecutive samples of the actual fallout with an ingenious device in the overhead. Meanwhile, we were determining from the dosimeter tube when the fallout event was over and whatever had been deposited was undergoing normal radiological decay. That would suffice for our operational controls. Carl's samples would go back to NRDL for detailed analysis.

After several hours, the outside radiation hazard had decreased to the point that we could begin to consider outside operations. I dressed out in a bulky jumpsuit, hood, and booties. These did not offer me any significant protection. What they did was keep my own clothes and shoes from becoming contaminated. Finally, we spun the dogs on the shelter door and opened it a crack. Bright sunlight at the far end of the entrance tunnel showed me that the blast wave had dislodged several sheets of plywood. Other damage details would come later. The radiation level next to the door was not much higher than in the shelter. I went slowly up the tunnel, watching the survey meter carefully. We were allowed only a limited amount of radiation exposure per year and I did not want to "burn myself out." I proceeded up the tunnel rise until I could see that the blast wave had blown most of the tarps off our jeeps, which were protected by a modest berm. With two quick steps, I was clear of the tunnel. The earth cover appeared normal but something was different. For a brief instant, I puzzled as I took in the ventilation hood, the dosimeter tube and the series of stakes with film detection patches on the berm. Then the dissonant element in the scene came to me: the shot tower was gone. I took a measurement to compare with the dosimeter data and raced back to the shelter, stripping off my booties as I entered the shelter. As I did so, I noticed that Robert Corsbie was using the phone.

We began to schedule the next phase of the project. It was now about noon. We calculated that we could start the decontamination operation in about two hours and spend an hour doing the job without giving the equipment operators their "tolerance dose." I phoned in the schedule to the control point. They okayed and then signed off by saying the helicopter was on its way. "What helicopter?" I questioned. There was no helicopter in my plan. "Mr. Corsbie's helicopter," was the reply. We could hear the racket through the ventilator. Mr. Corsbie put on a pair of booties and made off through the entrance

tunnel. The helicopter was kicking up a lot of dust and I mentally hoped Corsbie would have to buy a new suit to replace the one he had on.

Mr. Corsbie had stayed long enough to claim that he had been in the closest manned station to a nuclear blast but he missed half the show. I still remember Hong Lee, dressed in booties and hood, directing the fleet of earth-moving machines with hand signals from the top of the shelter while they cleared successively larger areas around him. As Dick Laurino said, he was like a circus ringmaster maneuvering a herd of elephants.

The Paper Trail

There were always hundreds of observers invited to the weapons tests in Nevada. Most of these were local civil defense directors who often paid their own way to witness an actual nuclear explosion. My dad was one of these when he was civil defense director of Ingham County, Michigan in the 1950s. Unfortunately, he was not there when I was there but the routine was well established. A tour was set up for these visitors and our shelter became one of the most popular stops on the tour. I was at the shelter each morning at 10 am when the tour buses would arrive and 30 or 40 visitors would troop into the shelter. I would then present a briefing. By that time I was an experienced speaker and my pitch was of great interest to these people on the VIP tour. They seemed to hang on every word. Nonetheless, as I spoke I noticed each day that three or four of the gentlemen, while keeping their gaze on me, would sidle over to the shelter wall and run their fingers over the corrugations of the metal shell like stroking a cat.

As a group was about to leave one day, I accosted one gentleman. “Pardon me, sir,” I said, “I wonder if you would answer one question.” “Surely,” he replied. I went on, “I noticed that while I was speaking you went over to the shelter wall and ran your fingers over the metal. You are not alone in this. Several others have done so. Would you please tell me why you did it?”

“Well, son,” he said. “I’ve been in civil defense eight years now and this is the first thing I’ve touched that wasn’t paper.”

That remark made a huge impression on me. I had never realized how important real things were for people whose mission was to be prepared for a terrible but remote possibility. Specialized things like shelters were especially useful in bringing an aura of reality to paper plans. Radioactivity requires specialized detection equipment—radiacs, we called them—and they serve a similar function in bringing realism to emergency planning. I appreciated anew Herman Kahn’s remark that every person should have a dosimeter—even if it didn’t work.

The environmentalists made their cause more real by pushing recycling. Most recycling doesn’t make economic sense and some cause environmental harm, such as forest fires made worse by underbrush that used to be used for making paper before recycled paper took over. Aluminum cans are the worst because they survive for centuries and only a

fraction are recycled. But they can't be outlawed now. The environmental movement depends on them.